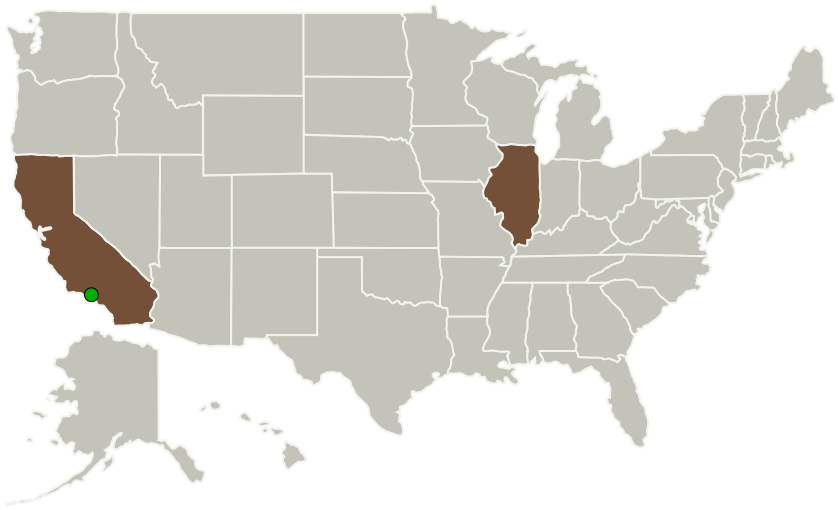
Improved Microwave Photonic Links via Receive-Side Nonlinear Signal Processing, Phase I

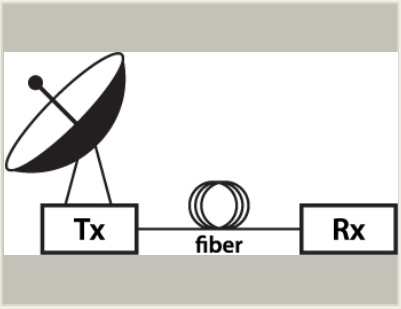
Completed Technology Project (2017 - 2017)

Project Introduction

We propose to significantly enhance the state-of-the-art of photonically-assisted microwave measurement and distribution systems by incorporating a highly efficient nonlinear optical process into the system design. The use of a nonlinearity can improve the dynamic range of the system without causing a reduction in the inherent noise-figure, thus eliminating a trade-off currently encountered when designing microwave-photonic systems. The photonic system will optically down-convert the microwave signal of interest thereby eliminating electronic mixers that can otherwise add loss, reduce dynamic range, and constrain the operating frequency range. Furthermore, we propose to exploit an emerging highly efficient modulator technology which is well suited to photonic integration. The expected net result is a high performance measurement of microwave signals over large frequency ranges (e.g. 10 - 100+ GHz) with low size, weight, and power. The systems will be well suited for integration into spacecraft as only a simple phase modulator is required at the antenna since almost all of the measurement apparatus can be connected to the modulator via low loss, low weight, and electro-magnetic interference free optical fiber.

Primary U.S. Work Locations and Key Partners





Improved Microwave Photonic Links via Receive-Side Nonlinear Signal Processing, Phase I Briefing Chart Image

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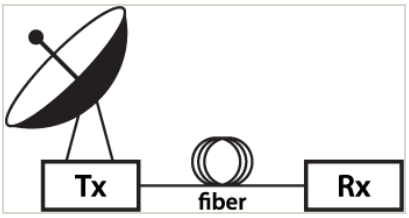
Organizations Performing Work	Role	Type	Location
NuCrypt, LLC	Lead Organization	Industry	Skokie, Illinois
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Illinois

Images



Briefing Chart Image
Improved Microwave Photonic Links via Receive-Side Nonlinear Signal Processing, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/128521)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
NuCrypt, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

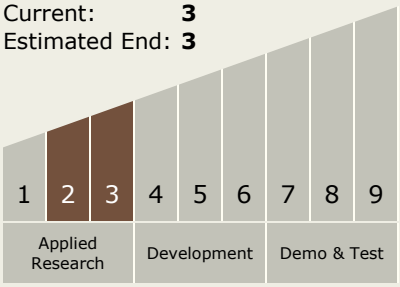
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Gregory Kanter

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System